

Jacobs Engineering Group Inc.
Building 318, 318 East Inner Road
Otis ANG Base, Massachusetts 02542
508-564-5746 Fax 508-564-6425

06 July 1999

Mr. Jim Snyder
Remediation Program Manager
HQ AFCEE/MMR
322 E. Inner Road, Box 41
Otis ANG Base, MA 02542-5028

SUBJECT: Contract F41624-97-D-8006, Delivery Order 0014
MMR Plume Response Program
DO #0014 DCN/Proj # AFC-J23-35S19205-M17-0002
***Landfill-1 (LF-1) Post-Closure Monitoring Second Quarter Findings
(July 1999)***

Dear Mr. Snyder:

This letter reports on all activities included in second quarter 1999 post-closure monitoring at Landfill-1 (LF-1). Included are: (1) field findings and analytical results of semiannual groundwater sampling conducted at eight wells in the LF-1 Northwest Operable Unit (NWOU) during May 1999; and (2) results of the quarterly gas probe screening conducted at the 12 gas probes surrounding the perimeter of the LF-1 site during June 1999.

The eight monitoring wells in NWOU are located downgradient of the three uncapped cells (1947, 1951, and 1957) at LF-1. According to the *Final Comprehensive Plan for the Landfill-1 Plume* (Air Force Center for Environmental Excellence, 1996) it was determined in previous investigations that these cells were not a significant source of groundwater contamination; however, the groundwater downgradient of these cells would be monitored because of potential risks to human health. It was also concluded that iron and manganese appear to be leaching from NWOU. Groundwater monitoring at NWOU for volatile organic compounds (VOCs) and total metals is being included in this and future LF-1 post-closure monitoring reports because, like the 16 wells included in monitoring of the three capped cells (1970, Post-1970 and Kettle Hole), it provides information on groundwater downgradient of the LF-1 cells.

NWOU groundwater sampling results and parameters are included in Attachment A (NWOU Groundwater Monitoring Results). Attachment B (NWOU Well Descriptions and Water Levels) contains NWOU monitoring well information and water levels. Attachment C (Gas Probe Screening Results) includes the second quarter's gas probe screening results along with previous screening results. Attachment D (Figure 1) shows NWOU monitoring well locations. Attachment E (Figure 2) shows gas probe locations.

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Groundwater was sampled according to the technical procedure MMR TECH-015 of the *Massachusetts Military Reservation Plume Response Program Quality Program Plan* (Air Force Center for Environmental Excellence, 1998) using low-flow sampling methodology. The groundwater samples were sent to Quanterra Environmental Services for the following analyses: VOCs by method OLC 02.1; and total metals by method ILM 04.0.

All analytes detected in samples from the groundwater at the NWOU wells, except for antimony and thallium, were at concentrations below maximum contamination levels (MCLs). Among VOCs detected, chloroform (MCL= 100 µg/L) was found at low to trace concentrations (less than 4.0 µg/L) in seven of the eight wells; trichloroethene (MCL= 5.0 µg/L) was found at a concentration of 3.9 µg/L in well 27MW2071; and carbon tetrachloride (MCL= 5.0 µg/L) and tetrachloroethene (MCL= 5.0 µg/L) were detected at estimated concentrations (the analyte was detected, but the reported concentration is an estimated value) of 0.69 µg/L and 0.6 µg/L, respectively in well 27MW2061. Dissolved oxygen (DO) and oxidation reduction potential (ORP) values in all of the NWOU wells were high. Other groundwater investigations conducted at the Massachusetts Military Reservation (MMR) have shown that low DO and ORP values are an indication of organic contamination.

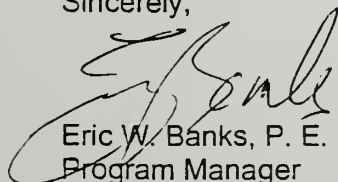
Among metals found in the groundwater, antimony (MCL= 6.0 µg/L) was detected at a concentration of 6.3 µg/L in well 27MW2084 and 5.5 µg/L in 27MW2061; and thallium (MCL= 2 µg/L) was found at estimated concentrations of 4.3 µg/L in 27MW2082, 3.9 µg/L in 27MW2083 and 8.3 µg/L in 27MW2084. Iron and manganese (detected in previous investigations and thought to be leaching from the uncapped cells) were also detected at concentrations relatively higher than those generally associated with ambient groundwater at the MMR.

The gas probe screening continued to show elevated levels of methane in the northeast corner of the 1970 Cell at GP-01, GP-02, and GP-03. Methane was not detected in any of the other probes.

Maintenance activities conducted in this quarter included: mowing of the landfill cover system; repairs to the front gate; and the replacement of monitoring well labels and caps where needed. Other maintenance needs, including repairs to the perimeter fence and efforts to improve the vegetative cover, where needed, on the cap will be performed in the coming months and discussed in the third quarter report (November 1999).

Please feel free to contact me or Darrin Smith at (508) 564-6192 (x290) if you have any questions or comments.

Sincerely,



Eric W. Banks, P. E.
Program Manager

Enclosures: Documents (11 and 1 EDD)



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Attachments:

Attachment A – NWOU Groundwater Monitoring Results

Attachment B – NWOU Well Descriptions and Water Levels

Attachment C – Gas Probe Screening Results

Attachment D – Figure 1

Attachment E – Figure 2

C: Bud Hoda, IRP (1)
 Paul Marchessault, EPA (3)
 Lynne Doty, DEP (1)
 Leonard Pinaud, DEP (4)
 Jo Ann Watson, ARE (1)
 David Hill, ARE (c/o IRP, 1)
 Larry Lumeih, ARE (1)
 Mary Ellen Maly, AEC (1)
 Denis LeBlanc, TRET (2)
 Richard Peralta, TRET (1)
 Dick Willey, TRET (1)
 Patti Tyler, TRET (1)
 Ray Kutzman, TRET (1)
 Warren Webb, TRET (1)
 Tom Cambareni, TRET (1)
 Scott Richmond, GF (2)
 Jim Quinn, FEC (1)
 John Moebes, JEG (1)
 Earl Parker, JEG (1)
 Darin Smith, JEG (1)
 Steve Witzmann, JEG (1)
 Drew Tingley, JEG (1)
 Laurie Ekes, JEG (1)
 File – Document Control, JEG (2)

Attachment A

NWOU Groundwater Monitoring Results

NWOU Groundwater Monitoring Results

Sample Location	27MW0705	27MW2061	27MW2071	27MW2081	27MW2082	27MW2083	27MW2084	27MW2085
Sample Depth (feet BTOC)	85.00	77.00	82.00	142.62	136.80	129.80	139.32	157.83
Sample Date	05/24/1999	05/24/1999	05/24/1999	05/24/1999	05/25/1999	05/25/1999	05/24/1999	05/24/1999
Units	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L

Total Metals (method ILM 04.1)

ALUMINUM (TOTAL)	ND	115	34.7J	111	ND	ND	56.8J	145
ANTIMONY (TOTAL)	ND	5.5	ND	ND	ND	ND	6.3	ND
ARSENIC (TOTAL)	ND	ND	ND	ND	ND	ND	ND	ND
BARIUM (TOTAL)	11.9J	54.3	9.4J	10.7J	10.2J	9J	2.7J	3.3J
BERYLLIUM (TOTAL)	ND	ND	ND	ND	ND	ND	ND	ND
CADMIUM (TOTAL)	ND	ND	ND	ND	ND	ND	ND	ND
CALCIUM (TOTAL)	2310	9340	5940	14500	42300	10900	1690	1770
CHROMIUM (TOTAL)	ND	ND	1.5J	5.4	5.2	ND	2.5J	3.1J
COBALT (TOTAL)	ND	ND	ND	ND	7.1	5	ND	ND
COPPER (TOTAL)	ND	ND	ND	ND	ND	ND	ND	ND
IRON (TOTAL)	ND	35.6J	26.1J	150	79.5J	30J	102	206
LEAD (TOTAL)	ND	ND	ND	ND	ND	ND	ND	ND
MAGNESIUM (TOTAL)	1340	2110	2390	7170	6780	6160	846	786
MANGANESE (TOTAL)	12.6	19	8.7J	182	53.4	7.5J	2.2J	6.3J
NICKEL (TOTAL)	ND	ND	ND	5.2J	6J	ND	2.4J	ND
POTASSIUM (TOTAL)	ND	1950	ND	1800	1420J	1340J	ND	ND
SELENIUM (TOTAL)	ND	ND	ND	ND	ND	ND	ND	ND
SILVER (TOTAL)	ND	ND	ND	ND	ND	ND	ND	ND
SODIUM (TOTAL)	4740	7150	5440	7560	8310	5690	5650	5540
THALLIUM (TOTAL)	ND	ND	ND	ND	4.3J	3.9J	8.3J	ND
VANADIUM (TOTAL)	ND	1.4J	ND	ND	ND	ND	2.1J	ND
ZINC (TOTAL)	4.5J	6.4J	4.1J	34.7	4.8J	7.5J	9.3J	5.6J
MERCURY (TOTAL)	ND	ND	ND	ND	ND	ND	ND	ND

NWOU Groundwater Monitoring Results

Sample Location	27MW0705	27MW2061	27MW2071	27MW2081	27MW2082	27MW2083	27MW2084	27MW2085
Sample Depth (feet BTOC)	85.00	77.00	82.00	142.62	136.80	129.80	139.32	157.83
Sample Date	05/24/1999	05/24/1999	05/24/1999	05/24/1999	05/25/1999	05/25/1999	05/24/1999	05/24/1999
Units	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
VOCs (method 0LC 02.1)								
1,1,1-TRICHLOROETHANE	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2,2-TETRACHLOROETHANE	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2-TRICHLOROETHANE	ND	ND	ND	ND	ND	ND	ND	ND
1,1-DICHLOROETHANE	ND	ND	ND	ND	ND	ND	ND	ND
1,1-DICHLOROETHENE	ND	ND	ND	ND	ND	ND	ND	ND
1,2,4-TRICHLOROBENZENE	ND	ND	ND	ND	ND	ND	ND	ND
1,2-DIBROMO-3-CHLOROPROPANE	ND	ND	R	R	ND	ND	R	R
1,2-DIBROMOETHANE (EDB)	ND	ND	ND	ND	ND	ND	ND	ND
1,2-DICHLOROBENZENE	ND	ND	ND	ND	ND	ND	ND	ND
1,2-DICHLOROETHANE	ND	ND	ND	ND	ND	ND	ND	ND
1,2-DICHLOROPROPANE	ND	ND	ND	ND	ND	ND	ND	ND
1,3-DICHLOROBENZENE	ND	ND	ND	ND	ND	ND	ND	ND
1,4-DICHLOROBENZENE	ND	ND	ND	ND	ND	ND	ND	ND
2-HEXANONE	ND	ND	ND	ND	ND	ND	ND	ND
ACETONE	R	R	R	R	R	R	R	R
BENZENE	ND	ND	ND	ND	ND	ND	ND	ND
BROMOCHLOROMETHANE	ND	ND	ND	ND	ND	ND	ND	ND
BROMODICHLOROMETHANE	ND	ND	ND	ND	ND	ND	ND	ND
BROMOFORM	ND	ND	ND	ND	ND	ND	ND	ND
BROMOMETHANE	ND	ND	ND	ND	ND	ND	ND	ND
CARBON DISULFIDE	ND	ND	ND	ND	ND	ND	ND	ND
CARBON TETRACHLORIDE	ND	0.69J	ND	ND	ND	ND	ND	ND
CHLOROBENZENE	ND	ND	ND	ND	ND	ND	ND	ND
CHLOROETHANE	ND	ND	ND	ND	ND	ND	ND	ND
CHLOROFORM	1.3	2.7	3.1	0.55J	ND	3	0.57J	0.62J
CHLOROMETHANE	ND	ND	ND	ND	ND	ND	ND	ND
CIS-1,2-DICHLOROETHENE	ND	ND	ND	ND	ND	ND	ND	ND
CIS-1,3-DICHLOROPROPENE	ND	ND	ND	ND	ND	ND	ND	ND
DIBROMOCHLOROMETHANE	ND	ND	ND	ND	ND	ND	ND	ND
ETHYLBENZENE	ND	ND	ND	ND	ND	ND	ND	ND

NWOU Groundwater Monitoring Results

Sample Location	27MW0705	27MW2061	27MW2071	27MW2081	27MW2082	27MW2083	27MW2084	27MW2085
Sample Depth (feet BTOC)	85.00	77.00	82.00	142.62	136.80	129.80	139.32	157.83
Sample Date	05/24/1999	05/24/1999	05/24/1999	05/24/1999	05/25/1999	05/25/1999	05/24/1999	05/24/1999
Units	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L

METHYL ETHYL KETONE (2-BUTANONE)	R	R	R	R	R	R	R	R
METHYL ISOBUTYL KETONE	ND	ND	ND	ND	ND	ND	ND	ND
METHYLENE CHLORIDE	ND	ND	ND	ND	ND	ND	ND	ND
STYRENE	ND	ND	ND	ND	ND	ND	ND	ND
TERT-BUTYL METHYL ETHER	ND	ND	ND	ND	ND	ND	ND	ND
TETRACHLOROETHENE(PCE)	ND	0.6J	ND	ND	ND	ND	ND	ND
TOLUENE	ND	ND	ND	ND	ND	ND	ND	ND
TRANS-1,2-DICHLOROETHENE	ND	ND	ND	ND	ND	ND	ND	ND
TRANS-1,3-DICHLOROPROPENE	ND	ND	ND	ND	ND	ND	ND	ND
TRICHLOROETHENE(TCE)	ND	ND	3.9	ND	ND	ND	ND	ND
VINYL CHLORIDE	ND	ND	ND	ND	ND	ND	ND	ND
XYLENES, TOTAL	ND	ND	ND	ND	ND	ND	ND	ND

Parameters

Temperature (degrees centigrade)	14.26	13.34	13.47	14.79	15.04	13.15	13.22	13.96
Dissolved Oxygen (milligrams per liter)	10.76	9.80	9.36	7.19	6.09	8.21	11.26	10.71
Oxidation/Reduction Potential (millivolts)	444.7	452.8	441.2	211.1	160.2	208.5	194.4	173.5
Specific Conductivity (µS/cm)	56	124	89	192	318	153	51	52
pH (standard units)	5.19	5.02	5.25	5.77	6.42	5.62	6.01	6.16
Turbidity (NTU)	-0.1	0.1	1.4	3.2	4.6	1.0	1.2	3.3

Notes:

BTOC = below top of casing
µg/L = micrograms per liter
J = estimated concentration
ND = not detected
R = rejected
µS/cm = microsiemens per centimeter
NTU = nephelometric turbidity units

Attachment B

NWOU Well Descriptions and Water Levels

NWOU Well Description and Water Levels

Well Identification	Date Sampled	Measuring Point Elevation (ft msl)	Screen Length (feet)	Screen Elevation (ft msl)	Depth to Water (ft BTOC)	Groundwater Elevation (ft msl)	Location
27MW0705	24-May-99	144.93	10.2	57.98 - 68.18	80.96	63.97	West of 1957 Cell
27MW2061	24-May-99	132.27	10.0	53.55 - 63.55	68.50	63.77	West of 1947 Cell
27MW2071	24-May-99	137.26	10.0	53.27 - 63.27	73.84	63.42	Southwest of 1957 Cell
27MW2081	24-May-99	135.03	5.0	(-9.30) - (-4.30)	74.01	61.02	1700 feet west of LF-1, on Connery Ave.
27MW2082	25-May-99	138.09	5.0	(-0.70) - 4.30	76.60	61.49	1400 feet west of LF-1, 250 feet north of Connery Ave.
27MW2083	25-May-99	137.71	5.0	6.30 - 11.30	75.81	61.90	1300 feet west of LF-1, 750 feet north of Connery Ave.
27MW2084	24-May-99	142.70	5.0	1.33 - 6.33	80.84	61.86	1700 feet west of the LF-1, 1200 feet north of Connery Ave.
27MW2085	24-May-99	155.38	5.0	(-4.60) - 0.40	94.04	61.34	1900 feet west of LF-1, 1400 feet north of Connery Ave.

Notes:

1. Depth to water measurements are measured in feet below top of casing (ft BTOC).
2. Elevations are measured in feet mean sea level (ft msl).

Attachment C

Gas Probe Screening Results

Gas Probe Screening Results

Gas Probe Location	Sep-08					Dec-08					Mar-09					Jun-09				
	LEL	CH4	CO2	O2	PID	LEL	CH4	CO2	O2	PID	LEL	CH4	CO2	O2	PID	LEL	CH4	CO2	O2	PID
27VP0001 (10')	120	6.0	28.6	0.0	2.8	0	0.0	16.3	0.3	2.3	28	1.3	14.5	11.1	2.0	14	0.7	20.4	0.0	3.5
27VP0001 (20')	338	16.8	33.3	0.0	0.0	304	15.2	27.2	0.0	1.8	418	20.9	28.4	0.0	0.0	288	14.3	28.0	0.0	1.2
27VP0002 (10')	0	0.0	11.5	10.1	0.0	0	0.0	9.4	9.4	0.2	50	2.5	15.5	8.0	0.0	0	0.0	4.9	15.4	0.0
27VP0002 (20')	342	17.1	38.9	0.0	0.0	330	16.5	30.1	0.0	1.6	434	21.7	29.1	0.0	0.0	238	11.9	29.6	0.0	1.6
27VP0003 (10')	0	0.0	13.7	8.1	0.0	0	0.0	5.0	16.0	0.0	0	0.0	3.8	15.3	0.0	0	0.0	1.9	19.0	0.0
27VP0003 (20')	357	17.8	41.0	0.0	0.0	188	9.3	29.0	0.0	1.3	148	7.3	24.3	0.0	0.0	124	6.2	27.8	0.0	2.8
27VP0004 (10')	0	0.0	3.4	16.6	0.0	0	0.0	2.3	17.5	0.0	0	0.0	1.5	17.4	0.0	0	0.0	1.3	19.4	0.0
27VP0004 (20')	0	0.0	15.9	4.7	0.0	0	0.0	12.8	8.6	0.0	0	0.0	10.9	8.7	0.0	0	0.0	9.5	9.5	0.0
27VP0005 (10')	0	0.0	3.7	16.9	0.0	0	0.0	3.4	11.3	0.0	0	0.0	2.6	18.8	0.0	0	0.0	2.0	18.8	0.0
27VP0005 (20')	0	0.0	8.0	11.0	0.0	0	0.0	7.8	7.3	0.1	0	0.0	5.6	13.4	0.0	0	0.0	5.8	13.7	0.0
27VP0006 (10')	0	0.0	3.3	18.7	0.0	0	0.0	3.0	14.8	0.0	0	0.0	1.4	19.0	0.0	0	0.0	2.5	17.9	0.0
27VP0006 (20')	0	0.0	4.4	15.7	0.0	0	0.0	5.0	13.2	0.0	0	0.0	3.7	18.6	0.0	0	0.0	3.6	16.6	0.0
27VP0007 (10')	0	0.0	3.7	18.4	0.0	0	0.0	4.1	14.9	0.0	0	0.0	4.3	14.3	0.0	0	0.0	3.8	16.2	0.0
27VP0007 (20')	0	0.0	4.3	15.7	0.0	0	0.0	4.9	14.3	0.0	0	0.0	5.0	13.8	0.0	0	0.0	4.5	15.2	0.0
27VP0008 (10')	0	0.0	2.8	17.8	0.0	0	0.0	2.3	17.6	0.0	0	0.0	1.8	17.1	0.0	0	0.0	2.1	17.3	0.0
27VP0008 (20')	0	0.0	2.8	16.6	0.0	0	0.0	2.7	18.7	0.0	0	0.0	2.4	15.7	0.0	0	0.0	2.3	15.5	0.8
27VP0009 (10')	0	0.0	2.9	17.1	0.0	0	0.0	1.7	18.7	0.0	0	0.0	2.0	17.1	0.0	0	0.0	1.5	18.4	0.0
27VP0009 (20')	0	0.0	4.9	13.2	0.0	0	0.0	5.5	12.8	0.0	0	0.0	5.4	13.0	0.0	0	0.0	4.6	13.9	0.1
27VP0010 (10')	0	0.0	2.6	18.3	0.0	0	0.0	1.9	19.1	0.0	0	0.0	1.2	19.1	0.0	0	0.0	1.3	19.4	0.0
27VP0010 (20')	0	0.0	1.8	18.9	0.0	0	0.0	2.1	18.8	0.0	0	0.0	1.5	19.1	0.0	0	0.0	1.0	19.4	0.0
27VP0011 (10')	0	0.0	1.5	19.1	0.0	0	0.0	1.2	19.6	0.0	0	0.0	0.7	19.8	0.0	0	0.0	1.0	19.8	0.0
27VP0011 (20')	0	0.0	1.3	19.3	0.0	0	0.0	1.5	19.3	0.0	0	0.0	1.1	19.6	0.0	0	0.0	0.9	19.7	0.0
27VP0012 (10')	0	0.0	1.8	18.8	0.0	0	0.0	1.7	19.0	0.0	0	0.0	1.2	19.1	0.0	0	0.0	1.1	19.5	0.0
27VP0012 (20')	0	0.0	3.0	17.1	0.0	0	0.0	3.3	17.0	0.0	0	0.0	2.7	17.5	0.0	0	0.0	2.4	17.6	0.0

Notes:

LEL - lower explosive limit (%)

CH4 - methane (%)

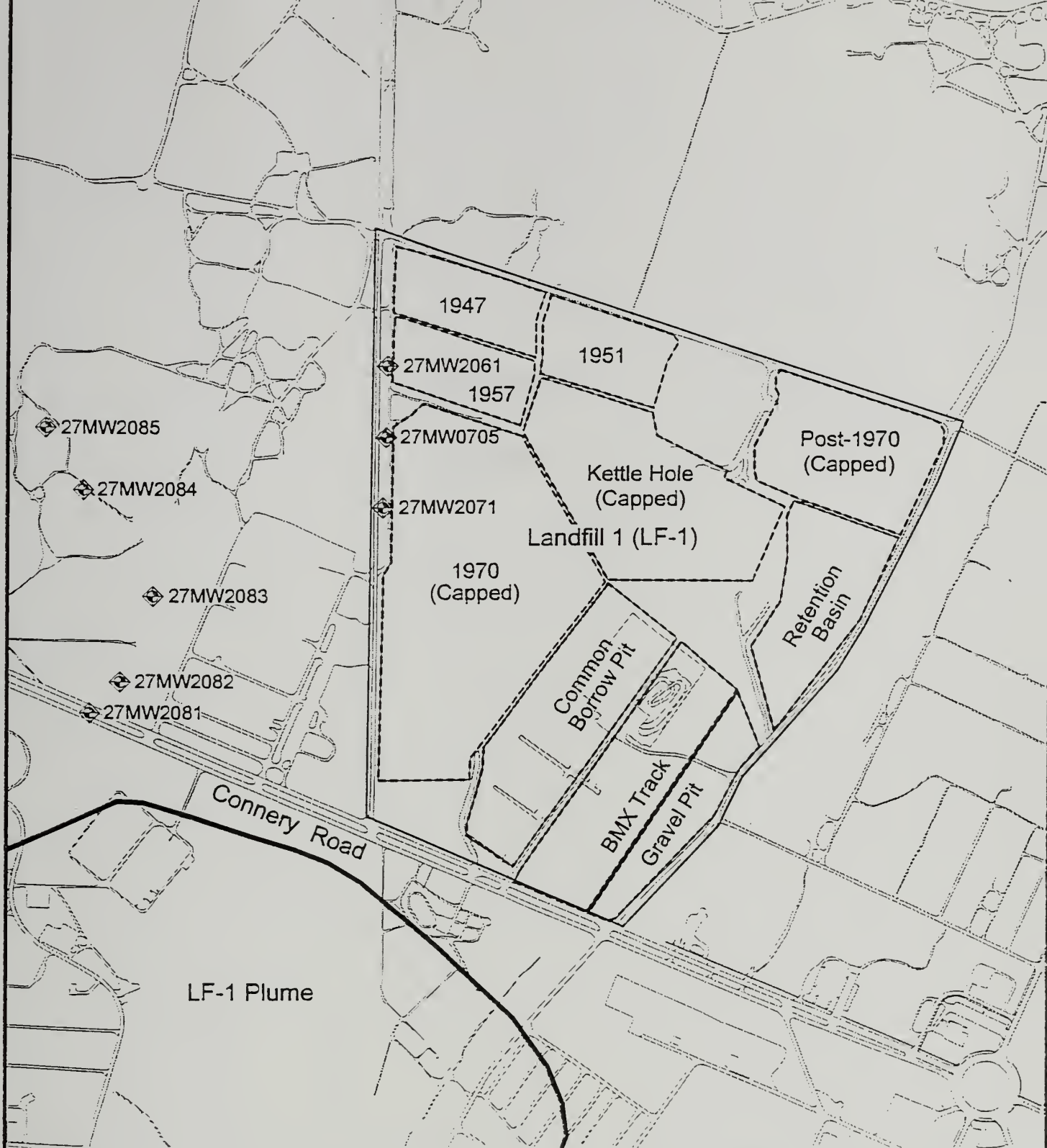
CO2 - carbon dioxide (%)

O2 - oxygen (%)

PID - photoionization detector (ppm)

Attachment D

Figure 1



Legend

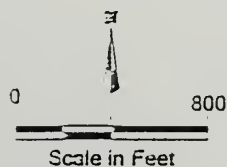


NWOU Well



Plume Boundary:

(Based on MCL exceedances
for TCE and PCE)



Scale in Feet



JACOBS ENGINEERING

LF-1 NWOU Groundwater Sampling Locations

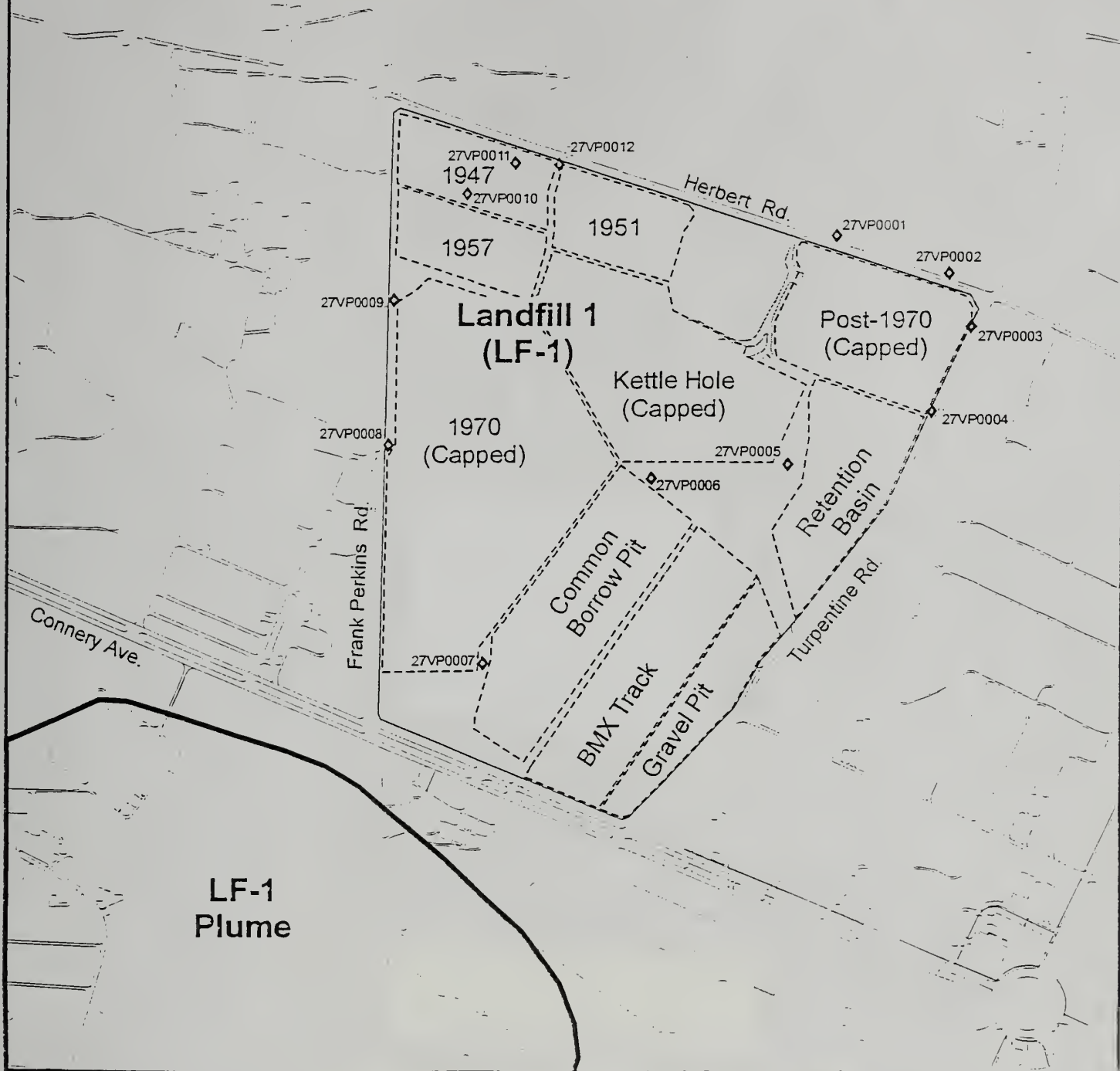
Massachusetts Military Reservation
Cape Cod, Massachusetts

6/28/99 SR LF1pam.dwg

Figure 1

Attachment E

Figure 2



Legend



Gas Probe



LF-1 Plume Boundary
(Based on MCL Exceedances
for TCE and PCE)

0

800

Scale in Feet



JACOB ENGINEERING

Post Closure Gas Probe Locations

Massachusetts Military Reservation
Cape Cod, Massachusetts

6/28/99 ms File...LF1bas-a.cdr

Figure 2

JONATHAN BOURNE PUBLIC LIBRARY



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2284
AD22915

For Reference

Not to be taken from this room

Jonathan Bourne Public Library
19 Sandwich Road
Bourne, MA 02532